



EN50155 Certified
Industrial Wireless
for the Rail Industry



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Application Coverage



Train-trackside



Railway Station



**Onboard, Inter-carriage,
and Train-to-Ground**

Trends

■ Rail Communications Go Wireless

	Satellite	Cellular	WLAN
Max Data Rate.	20 Mbps down/ 384 Kbps up	7.2 Mbps down/ 384 Kbps up	54 Mbps down/ 300 Mbps up
Throughput	Fair	Poor	Very good
Train Installation Cost	high	Low	Very low
Infrastructure Installation Cost	Very high	High (covered by carrier)	Low
Service Charges	Yes	Yes	No
Total Cost	Very high	Very high	Low
Roaming	None needed, but satellite occlusion blocks coverage in some areas	ISP-dependent	100 ms or less with fast roaming technologies
Mobility	300 km/h	about 150 km/h	about 150 km/h

Trends

■ Future-proof Wireless Rail Networks

▶ **Open standards**

- Easy integration with multi-vendor systems
- Secure future migration path

▶ **Cost effectiveness**

Lower wiring and operation costs

▶ **Uninterrupted services**

Resilient and redundant links

▶ **High speed mobility**

Effective roaming at high speeds

▶ **High bandwidths**

Reliable real time voice and VoIP communications

▶ **Interference-free**

Resistant to noise and multipath interferences





Train-to-Trackside

- ▶ **Passenger Information System**
- ▶ **Train Status Monitoring**

Customer Needs

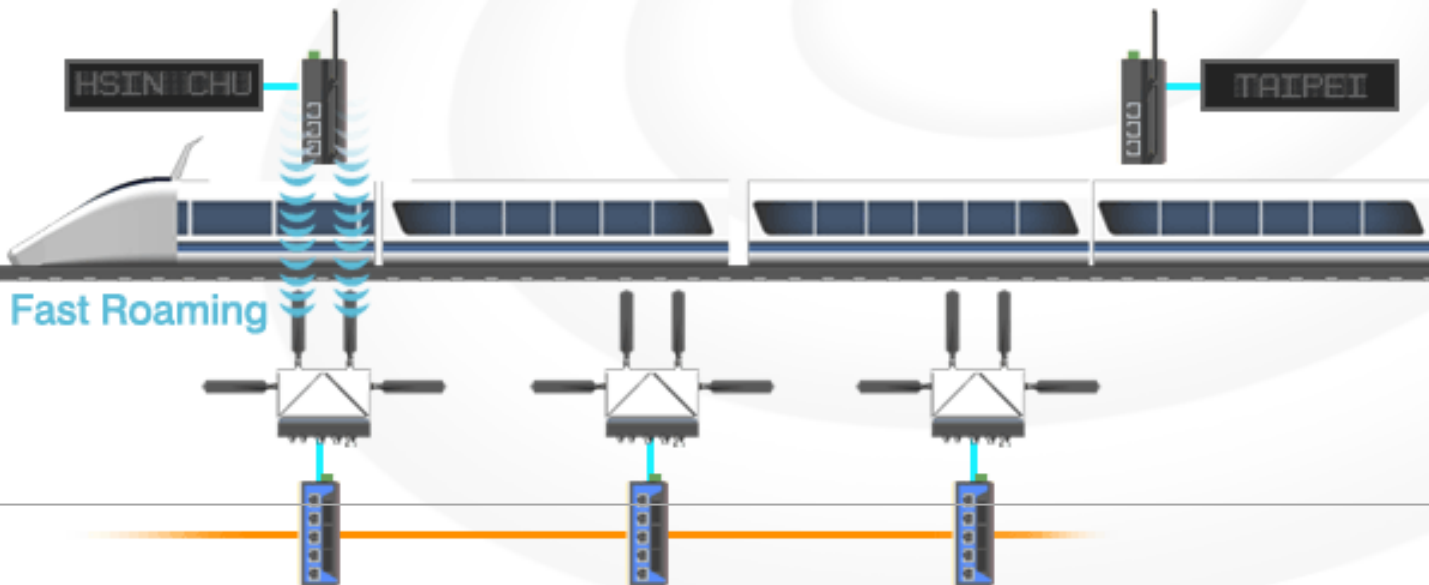
■ Uninterrupted Connectivity between Train and Trackside

- ▶ Centralized network management
- ▶ Remote train monitoring in real time
- ▶ Constant high-speed connectivity between train and trackside
- ▶ A flexible network architecture along the track
- ▶ Interference-free transmission of operating data



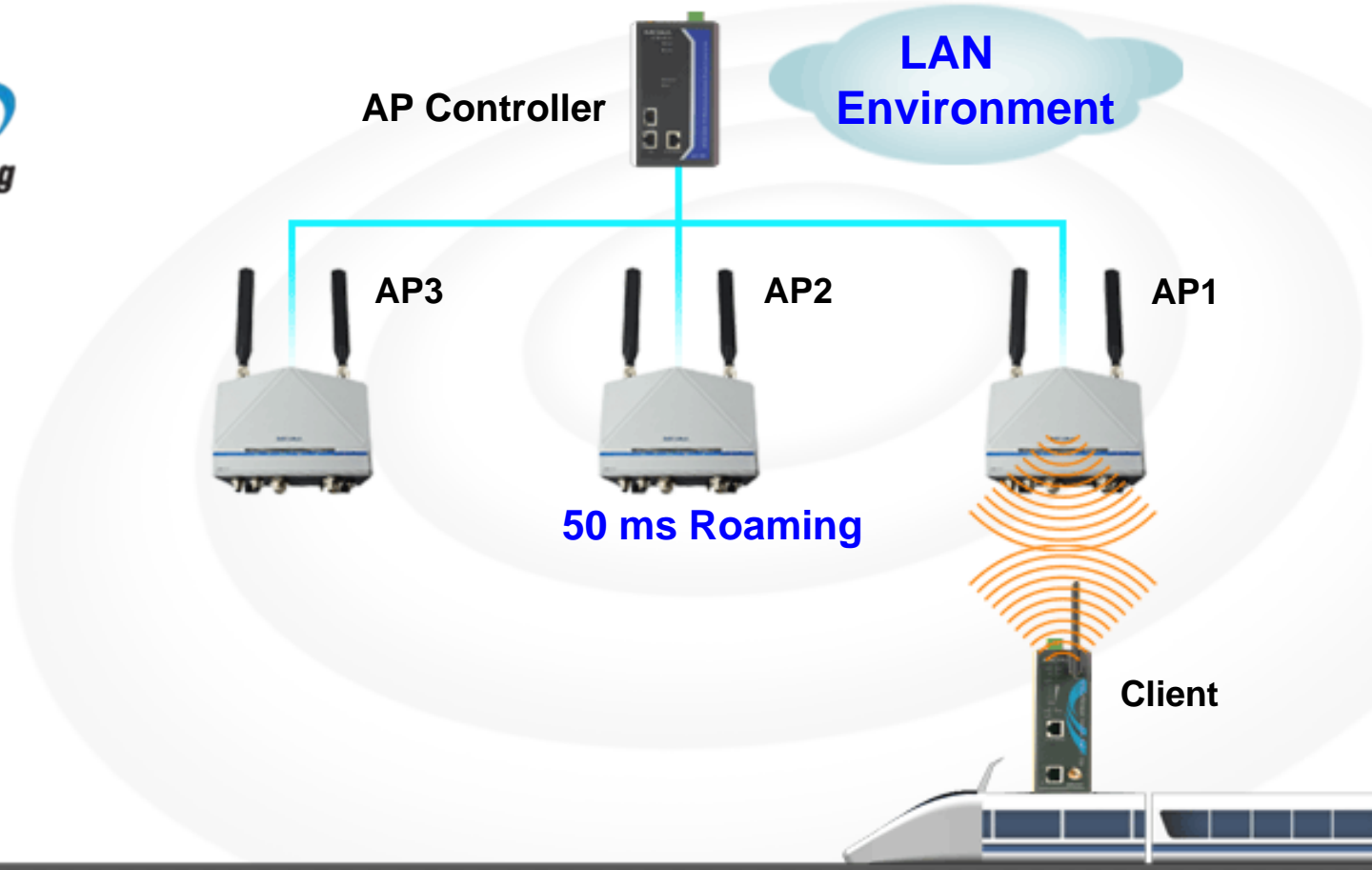
Moxa Solutions

- **150 km/h Data Links:**
 - High-speed data links during transport
- **Optimized AP Coverage along Long Tracks**
(ex: bridge Mode)
- **Form a Fiber Optic Backhaul Network**



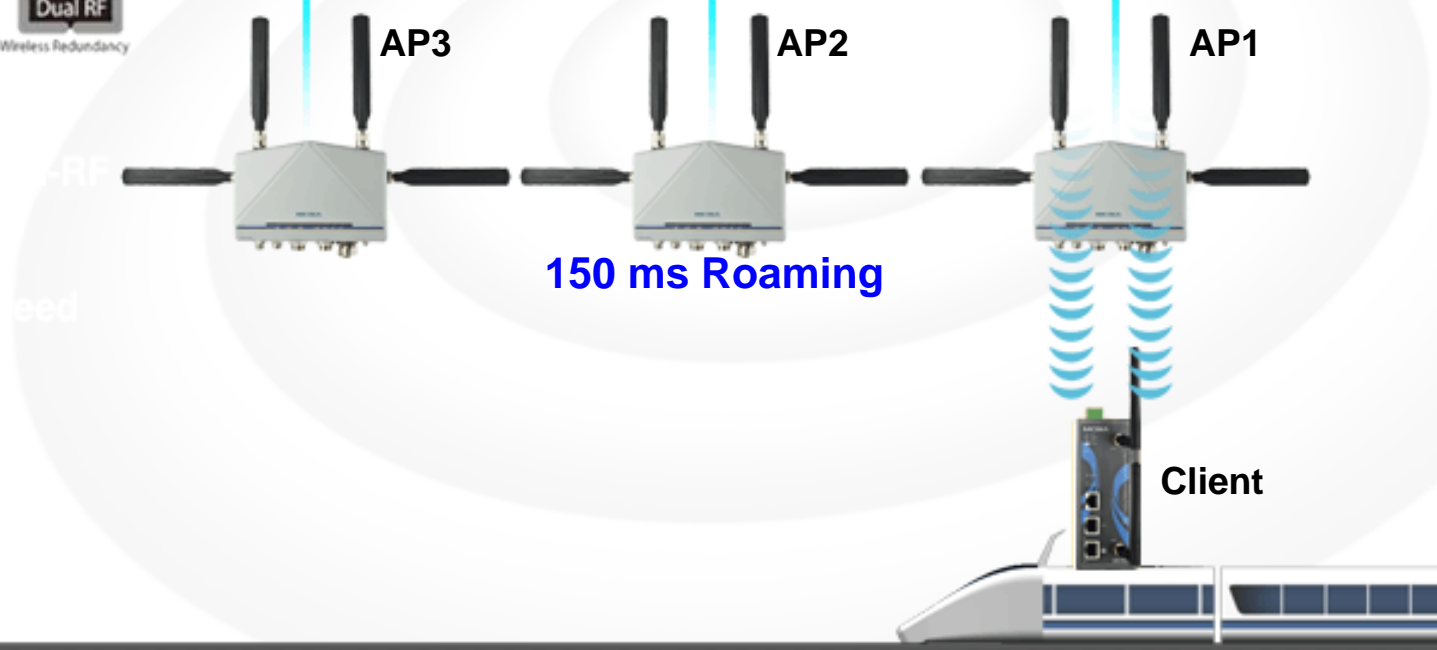
Moxa Solutions

■ 50 ms Roaming with AP Controller



Moxa Solutions

- Redundant Roaming for Non-Security System:
150 ms Roaming + Redundant Dual-RF Mode



Moxa Solutions

■ Interference-free Signal Transmission

- 2.4 and/or 5 GHz RF bands
- Tailor-made RF band service
- Level 3 EMS and metal housing

■ Designed for Harsh Rail Environments

- IP68 rating for direct field installation
- Vibration proof: M12 and screw-type RJ45 connectors
- Wide temperature operating: -40 to 75°C

■ Certifications

- On-board: EN50155/ EN50121-3-2/ IEC61373
- Trackside: EN50121-1/ EN50121-4



Railway Station Signaling

- ▶ Signaling System
- ▶ CMS (Changeable Messages Sign)

Customer Needs

■ Real Time Monitoring of Track Status

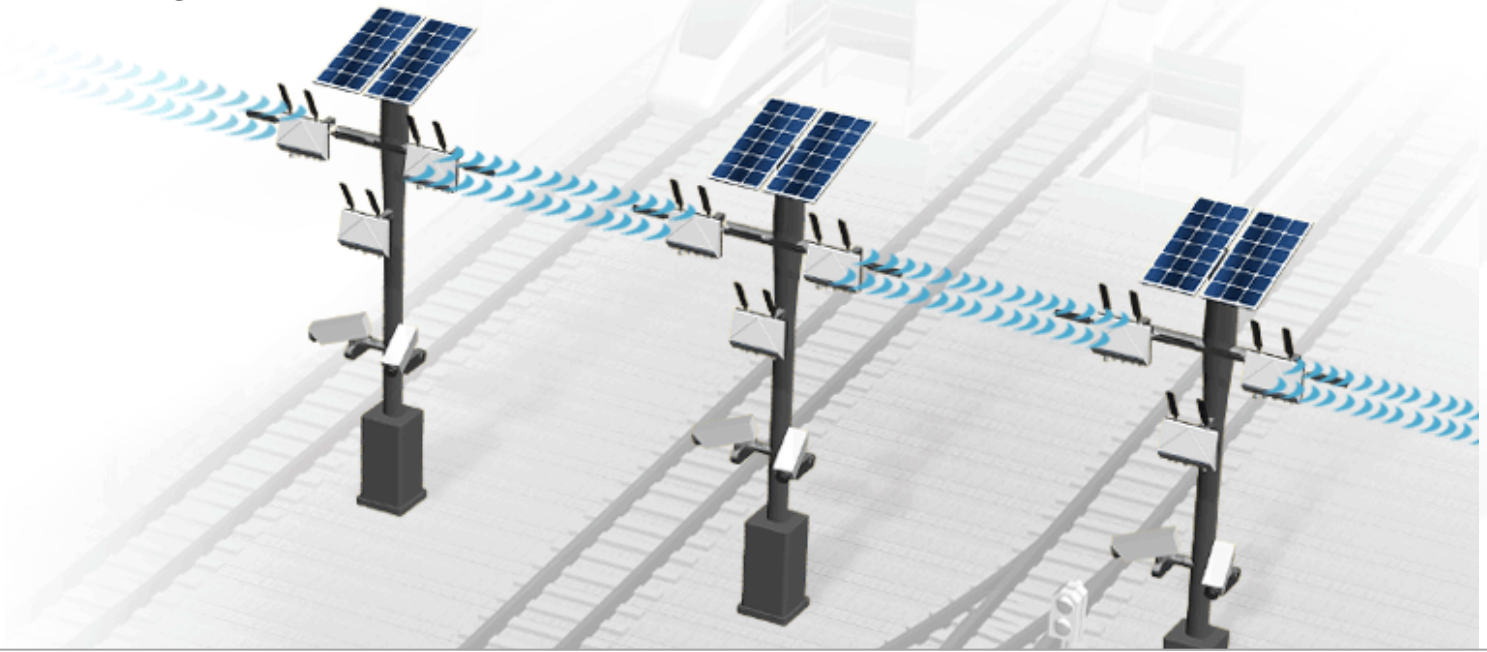
- ▶ Easy deployment with multi-vendor systems
- ▶ A widely distributed wayside network linking to OCC
- ▶ A resilient and redundant link
- ▶ Optimized AP network architecture for less cabling
- ▶ Real time monitor of track circuit signal devices



Moxa Solutions

■ Widely Distributed WLAN Networks Link Signaling Systems to OCC

- Redundant AP-client mode
- Wireless bridge mode



Moxa Solutions

- **High Throughput of up to 300 Mbps**
 - 802.11n for demanding video surveillance
- **Outdoor Design**
 - IP68 and -40 to 75°C
- **PoE Capability**
 - Simplify cable installation in the field





Onboard, Inter-Carriage & Train-to-Ground

- ▶ **Passenger Infotainment System (PIS)**
- ▶ **Video Surveillance**
- ▶ **VoIP System**
- ▶ **CBTC/ ATO/ ATP /ATS**

Customer Needs

■ Seamless Train-Ground Communications

- ▶ Uninterrupted train-ground connection
- ▶ Wireless coverage within train carriages
- ▶ Flexible carriage change and low maintenance
- ▶ Efficient network traffic and security
- ▶ High bandwidth for real time PIS and video surveillance
- ▶ Resist continued vibration and shock



■ Dual-RF Design

- Inter-carriage communications:
 - AP-client mode
 - Wireless bridge mode
- Multiple SSID Support
- 2.4 and/or 5 GHz RF bands
- Flexible carriage change

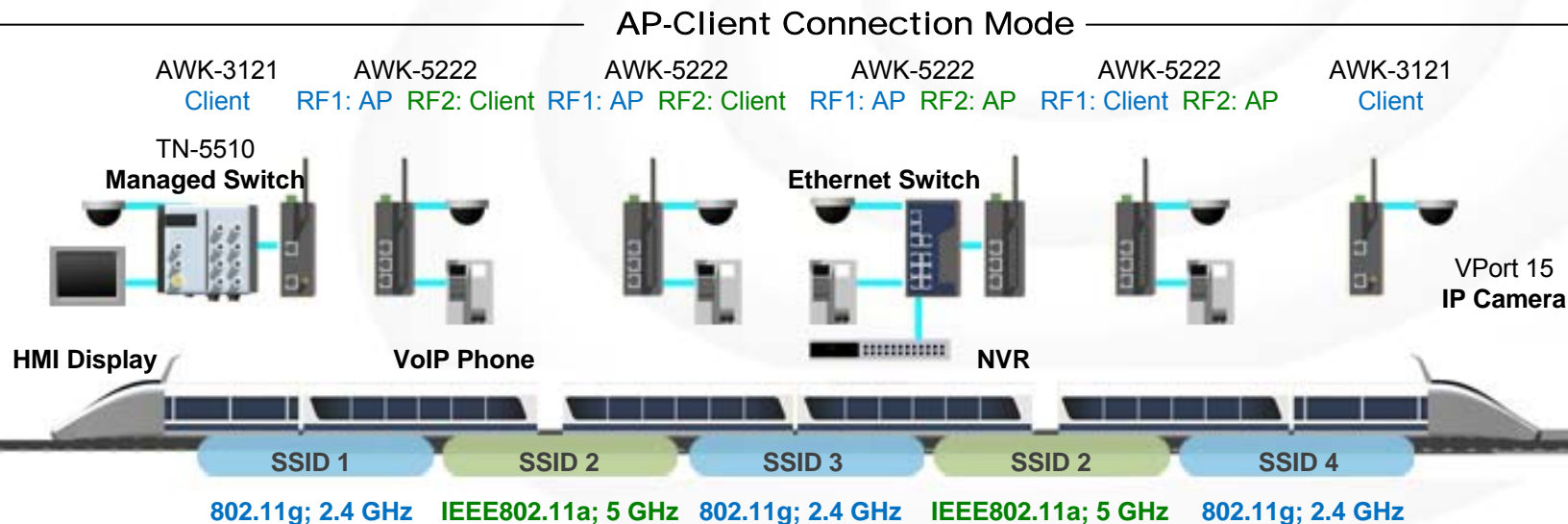
■ 20 Mbps Throughput for IP Camera Connections

■ QoS/VLAN Separates Display and Passenger Traffic

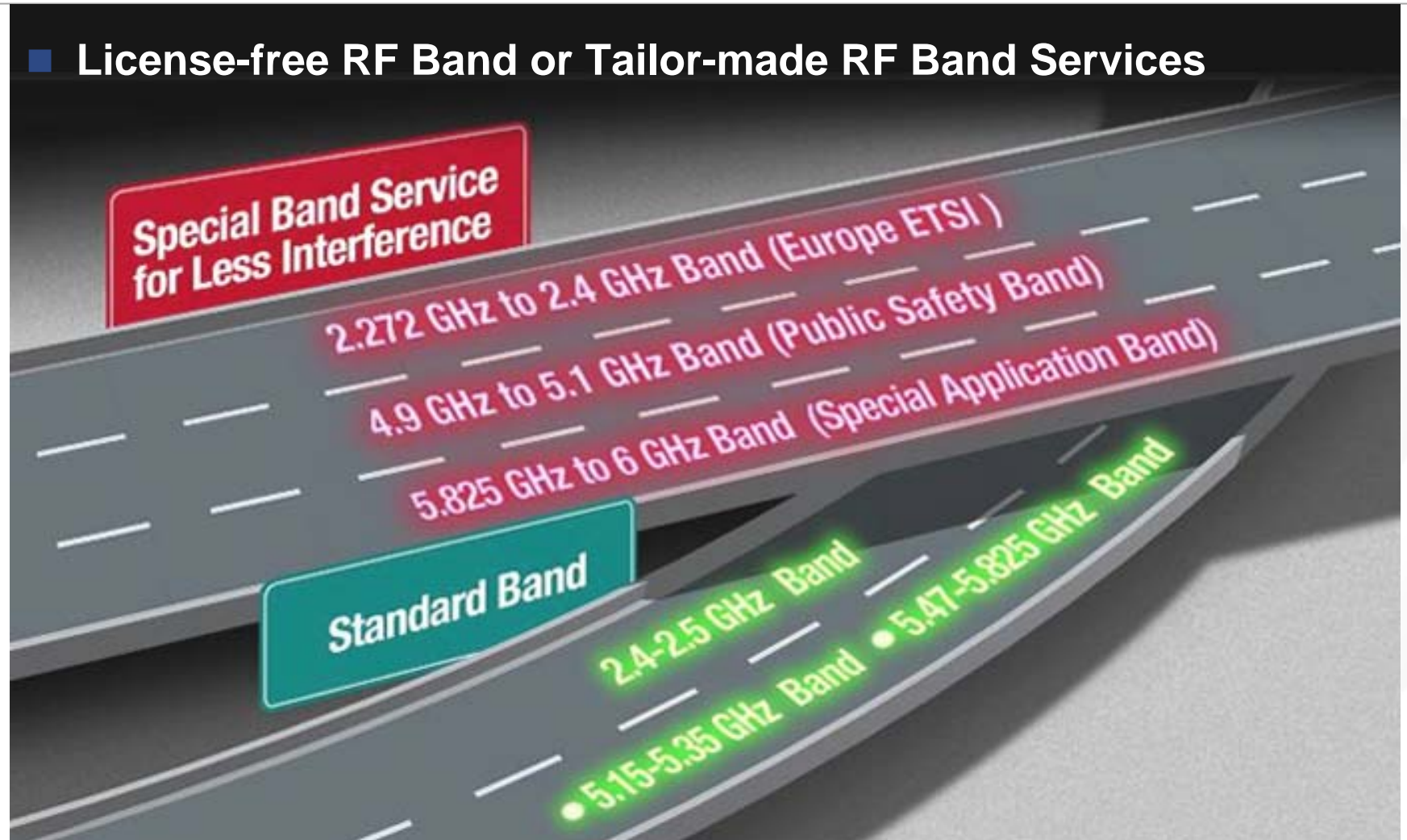
■ Stable Mechanical Design

- M12 and screw-type connectors

■ EN50155 Certified



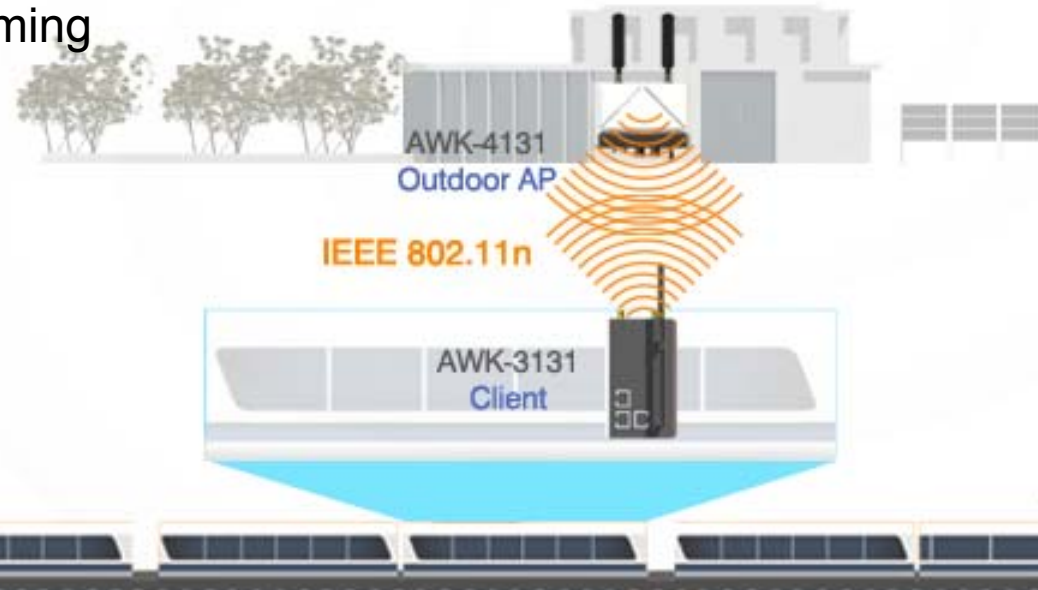
- License-free RF Band or Tailor-made RF Band Services



Moxa Solutions *Train-to-Ground*

■ Secure Roaming

- **High speed roaming (< 50 ms):**
Low latency supports more than 200 APs for delay-sensitive applications (ex: VoIP)
- **Fast redundant roaming:**
Redundant dual-RF mode and 100 ms roaming



Moxa Solutions *Train-to-Ground*

■ High Bandwidth 802.11n

Up to 300 Mbps for video streaming



Standard	IEEE 802.11b	IEEE 802.11a	IEEE 802.11g	IEEE 802.11n
Year Approved	1999	1999	2003	2009
Compatibility	IEEE 802.11b	IEEE 802.11a	IEEE 802.11b/g	IEEE 802.11a/b/g
Frequency Band	2.4 GHz	5 GHz	2.4 GHz	2.4/ 5 GHz
Channel Bandwidth	20 MHz	20 MHz	20 MHz	20 or 40 MHz
Number of Spatial Streams	1	1	1	2
Max. Data Rates	11 Mbps	54 Mbps	54 Mbps	300 Mbps
Spread Spectrum	DSSS	OFDM	OFDM, DSSS	OFDM

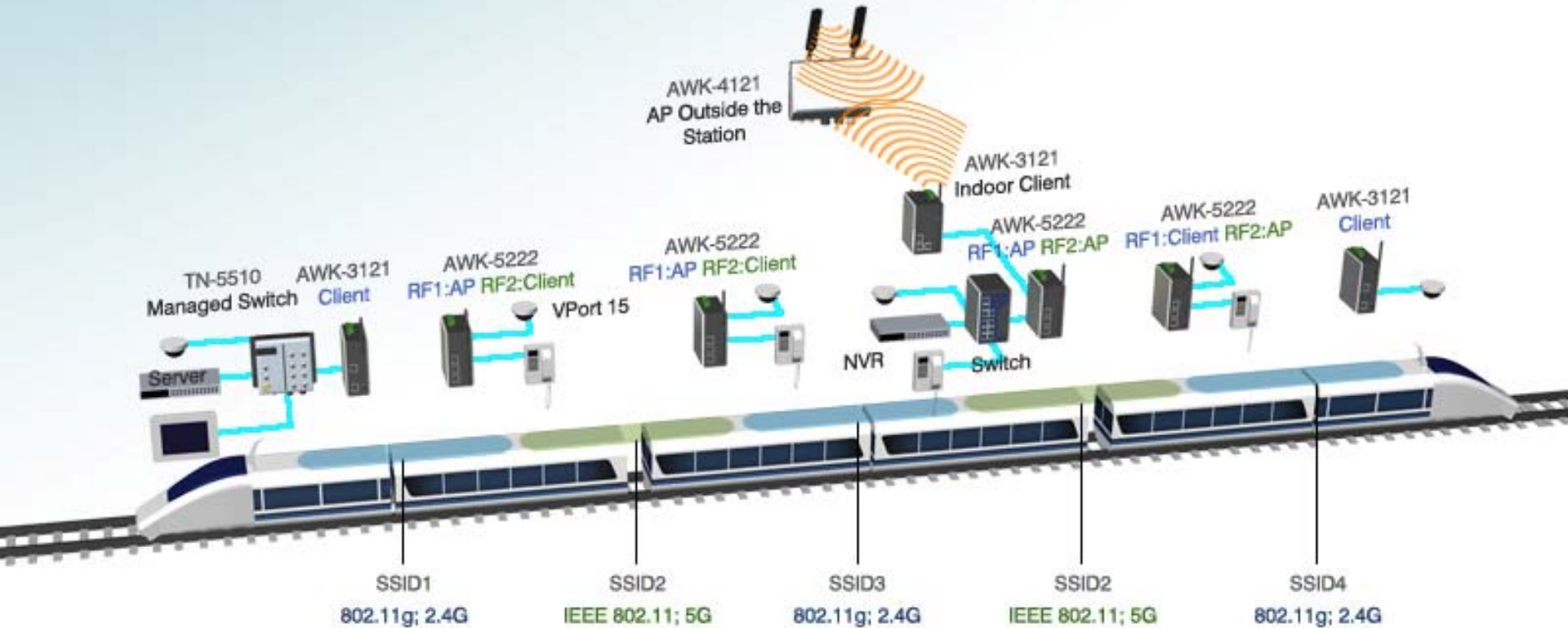


Case Studies

Onboard/Train-to-Ground



AP-Client Connection Mode



At a Glance

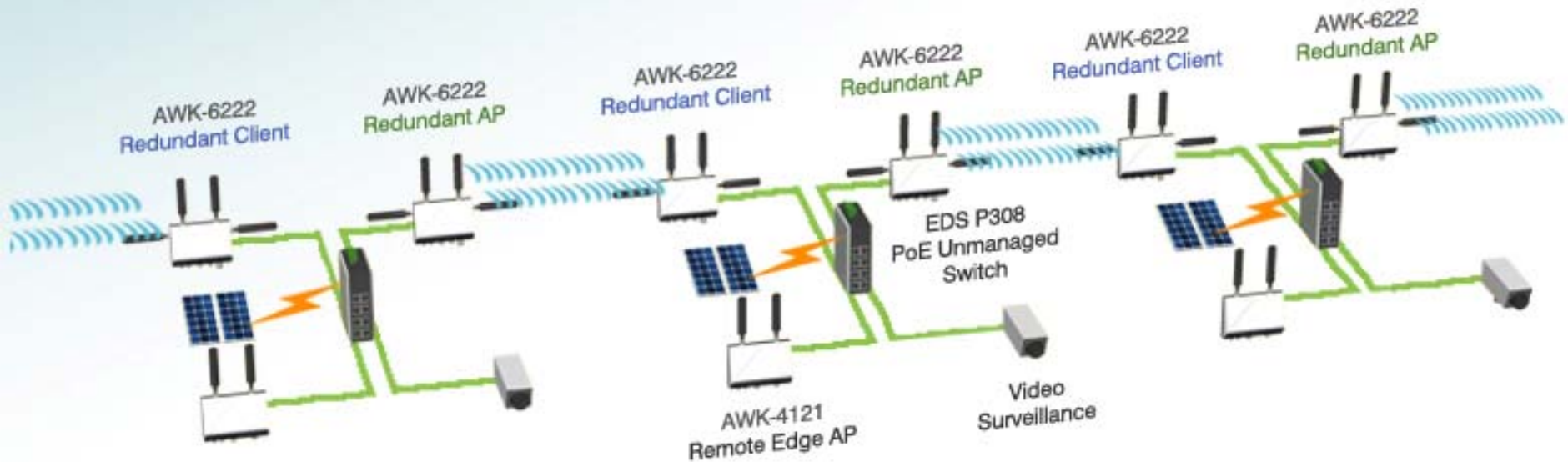
- **Location:** Americas
- **Solutions:** Onboard and train-to-ground
- **Customer Needs:**
 - Inter-carriage communications
 - Seamless train-ground connectivity
- **Moxa Advantages:**
 - AP-client mode on trains
 - Moxa Turbo Roaming
 - 25 Mbps throughput for video streaming
- **Products:**
 - Inter-carriage link: AWK-6222 and AWK-3121
 - Train-to-ground: AWK-4121, AWK-3121



Railway Station



Redundant AP-Client Connection Mode



At a Glance

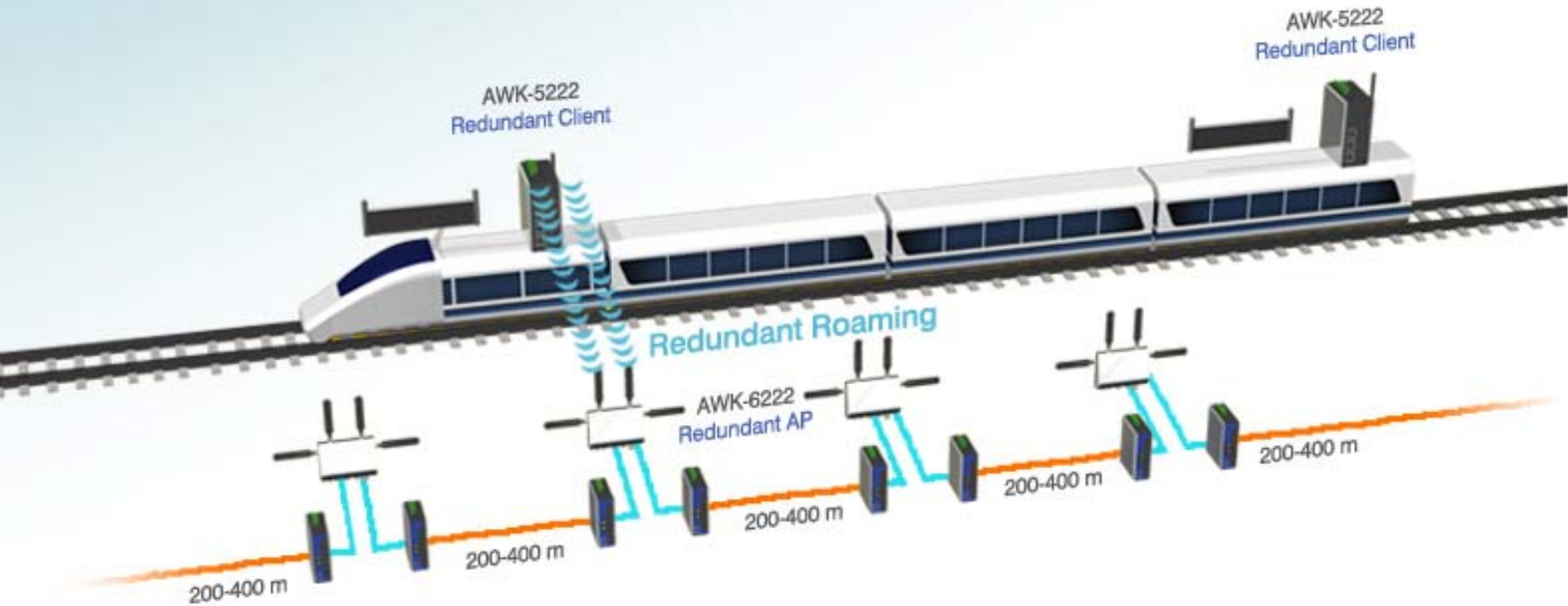
- **Location:** Asia
- **Solutions:** Railway station
- **Customer Needs:**
 - Real time monitor of railway signals, track circuit and switches
- **Moxa Advantages:**
 - Redundant AP-client mode
 - 25 Mbps throughput for video streaming
 - Outdoor design: IP68 and -40 to 75°
 - PoE-enabled Ethernet network
- **Products:**
 - Redundant AP-client mode: AWK-6222
 - Remote edge AP: AWK-4121
 - PoE enabled network: EDS-P308



Train-Trackside



Fiber Optic Backhaul Network



At a Glance

- **Location:** Japan
- **Solutions:** Train-Trackside
- **Customer Needs:**
 - Constant high-speed connectivity between train and trackside
- **Moxa Advantages:**
 - Optimized AP coverage
 - Fast Redundant Roaming
 - A fiber optic backhaul network
- **Products:**
 - Trackside AP: AWK-6222
 - On-train client: AWK-5222
 - Fiber optic backhaul: IMC-101





Product Brief

▶ **Wireless Network**

- Dual RF Solutions
- 50 ms Roaming Solutions
- 802.11n Solutions

▶ **Wired Ethernet Network**

▶ **IP Video Surveillance**

Wireless Network

■ Dual RF Solutions

AWK-6222 series

Outdoor Dual RF
AP/Bridge/Client

Outdoor



AWK-5222 series

Dual RF
AP/Bridge/Client

Indoor



▶ Multiple Redundant Mechanisms

Wireless /Ethernet /Power redundancy

▶ Redundant Roaming

Turbo Roaming + redundant dual-RF mode

▶ Smooth Network Traffic

QoS (WMM), VLAN, multi-SSID, 25Mbps throughput

▶ Non-Interference

2.4 and/or 5 GHz RF bands

▶ Industrial Hardened: IP68 and -40 to 75°C

▶ Certifications

- On-board: EN50155/ 50121-3-2 & IEC61373
- Trackside: EN50121-1/ 50121-4
- EMI/EMS: EN61000-6-4/61000-6-2

Wireless Network

■ 50 ms Roaming Solutions

AWK-4121 series

Single RF
AP/Bridge/Client

Outdoor



AWK-3121 series

Single RF
AP/Bridge/Client

Indoor



▶ High-speed Roaming

Handoff delay <50 ms

▶ Smooth Network Traffic

QoS (WMM), VLAN, and 25 Mbps throughput

▶ Non-Interference

Level 3 EMS and metal housing

▶ Industrial Hardened

IP68 and -40 to 75°C

▶ Certifications

- On-board: EN50155/ 50121-3-2 & IEC61373
- Trackside: EN50121-1/ 50121-4
- EMI/EMS: EN61000-6-4/61000-6-2

Wireless Network

■ 50 ms Roaming Solutions

WAC-1001

AP Controller



- ▶ Supports all AWK Series Products
- ▶ Supports 50ms Roaming between APs
- ▶ Supports WEP/WPA/WPA2 PSK and Enterprise Security

Wireless Networks

■ High Bandwidth 802.11n

AWK-4131 series

Single RF
AP/Bridge/Client

Outdoor



AWK-3131 series

Single RF
AP/Bridge/Client

Indoor



- ▶ **High Bandwidth**
IEEE802.11n (300 Mbps)
- ▶ **Fast Roaming**
- ▶ **Smooth Network Traffic**
QoS (WMM), VLAN, and 25 Mbps throughput
- ▶ **Non-interference**
Level 3 EMS and metal housing
- ▶ **Industrial Hardened**
IP68 and -40 to 75°C
- ▶ **Certifications**
 - On-board: EN50155/ 50121-3-2 & IEC61373
 - Trackside: EN50121-1/ 50121-4
 - EMI/EMS: EN61000-6-4/61000-6-2

Wireless Network

■ EN50155 Ethernet Network

TN-5000 series

8-port Unmanaged
PoE Switches



- ▶ **Robust M12 Connection**
- ▶ **Up to 2 GB Ports with Bypass Relay**
- ▶ **Wide Power Inputs**
12-110 VDC, LV-MV mode
- ▶ **Certifications**
EN50155/50121-3-2/50121-4
- ▶ **Optional PoE and -40 to 75°C**

Wireless Network

■ PoE-Enabled Ethernet Network

EDS-P308 series

8-port Unmanaged
PoE Switches



- ▶ IEEE802.3af Compliant
- ▶ Up to 15.4 W at 48 VDC per PoE Port
- ▶ Redundant Dual VDC Power Inputs
- ▶ Intelligent Power Consumption Detection and Classification
- ▶ -40 to 75°C

IP Surveillance

■ Fiber Optic Network

IMC-101 series

Ethernet-to-fiber
Media Converters



- ▶ 10/100Base-TX to 100Base-FX
- ▶ Link Fault Pass-Through (LFP)
- ▶ Redundant Power Inputs
- ▶ Power Failure, Port Break Alarm by Relay Output
- ▶ -40 to 75°C

IP Surveillance Solutions

■ EN50155 IP Surveillance

VPort 15-M12

EN50155 IP Camera



- ▶ **1.3-megapixel, Compact Fixed Dome IP Cameras**
- ▶ **MPEG4 and MJPEG Dual Video Streams Simultaneously**
- ▶ **M12 Connection and IP66 Protection Resist Vibrations, Humidity, and Dust**
- ▶ **-25 to 55°C**
- ▶ **Certifications**
Rolling Stock: EN50155 Certified

Trusted Business Value from Moxa

Trusted Single Source

- ▶ A single source for wireless and wired LAN solutions
- ▶ Sustained value with upgradeable, standards-based solutions

Trusted Partnership

- ▶ 23-year proven experience in Industrial Networking
- ▶ **Client references:**
Ansaldo,
Bombardier,
Thales,
Kyosan,
Insigma

Trusted Quality

- ▶ 5-year warranty
- ▶ Strict 24-hour dynamic burn-in policy
- ▶ Certifications:
C1D2/ATEX Zone 2,
DNV, EN60950,
UL508, IEC 61850,
EN50155, e/E mark

Trusted Services

- ▶ Tailor-made RF band service
- ▶ Strong technical experts who understand unique customer needs
- ▶ Branch offices and distributors over 60 countries



BOMBARDIER

THALES



KYOSAN



..... Thank You

